

What is claimed is:

1. A plasma CVD apparatus comprising:

first and second electrodes;

neutral gas introduction pipes; and

a plasma confining electrode interposed

5 between said first and second electrodes to separate a plasma generation region and a substrate processing region,

wherein said plasma confining electrode has a hollow structure defined by an upper electrode plate,

10 and a lower electrode plate, and has gas diffusing plates provided in the hollow structure, and has radical passage holes provided to supply radicals from said plasma generation region into said substrate processing region while isolating from a neutral gas,

15 said plasma confining electrode is connected to said neutral gas introduction pipes, and a plurality of neutral gas passage holes are provided for each of said lower electrode plate and said gas diffusing plates to supply said neutral gas into said  
20 substrate processing region, and

a total opening area of said plurality of neutral gas passage holes in said gas diffusing plate on a side of said upper electrode plate is smaller than that of said plurality of neutral gas passage  
25 holes in said gas diffusing plate on a side of said lower electrode plate.

2.       The plasma CVD apparatus according to claim 1,  
wherein the number of said neutral gas passage holes  
in said gas diffusing plate on the side of said lower  
electrode plate is more than the number of said  
5 neutral gas passage holes in said gas diffusing plate  
on the side of said upper electrode plate.

3.       The plasma CVD apparatus according to claim 1,  
wherein first ones of said plurality of neutral gas  
passage holes in each of said gas diffusing plates are  
different in diameter from second ones of said  
5 plurality of neutral gas passage holes in each of said  
gas diffusing plates.

4.       The plasma CVD apparatus according to claim 1,  
wherein positions of said neutral gas passage holes in  
said gas diffusing plate nearer to said lower  
electrode plate are different from positions of said  
5 neutral gas passage holes in said gas diffusing plate  
nearer to said upper electrode plate.

5.       The plasma CVD apparatus according to claim 4  
wherein a region of said neutral gas passage holes in  
said gas diffusing plate nearer to said lower  
electrode plate is arranged in an outside region of a  
5 region of said neutral gas passage holes in said gas  
diffusing plate nearer to said upper electrode plate.

6. The plasma CVD apparatus according to claim 1,  
wherein said gas introduction pipes extend from a  
lateral direction of said plasma confining electrode  
to be coupled to side portions of said plasma  
5 confining electrode.

7. The plasma CVD apparatus according to claim 1,  
wherein said gas introduction pipes extend to pass  
through a peripheral portion of said plasma generation  
region to be coupled to upper portions of said plasma  
5 confining electrode.

8. A plasma CVD apparatus comprising:  
first and second electrodes;  
neutral gas introduction pipes; and  
a plasma confining electrode interposed  
5 between said first and second electrodes to separate a  
plasma generation region and a substrate processing  
region,

wherein said plasma confining electrode has a  
hollow structure defined by an upper electrode plate,  
10 and a lower electrode plate, and has gas diffusing  
plates provided in the hollow structure, and has  
radical passage holes provided to supply radicals from  
said plasma generation region into said substrate  
processing region while isolating from a neutral gas,  
15 said plasma confining electrode is connected

to said neutral gas introduction pipes, and a plurality of neutral gas passage holes are provided for each of said lower electrode plate and said gas diffusing plates to supply said neutral gas into said  
20 substrate processing region, and

a distribution density of opening area consisting of said plurality of neutral gas passage holes is higher in a central portion of each of said gas diffusing plates than in a peripheral portion  
25 thereof.

9. The plasma CVD apparatus according to claim 8, wherein the number of said neutral gas passage holes in said gas diffusing plate on the side of said lower electrode plate is more than the number of said  
5 neutral gas passage holes in said gas diffusing plate on the side of said upper electrode plate.

10. The plasma CVD apparatus according to claim 8, wherein first ones of said plurality of neutral gas passage holes in each of said gas diffusing plates are different in diameter from second ones of said  
5 plurality of neutral gas passage holes in each of said gas diffusing plates.

11. The plasma CVD apparatus according to claim 8, wherein positions of said neutral gas passage holes in

said gas diffusing plate nearer to said lower  
electrode plate are different from positions of said  
5 neutral gas passage holes in said gas diffusing plate  
nearer to said upper electrode plate.

12. The plasma CVD apparatus according to claim  
11, wherein a region of said neutral gas passage holes  
in said gas diffusing plate nearer to said lower  
electrode plate is arranged in an outside region of a  
5 region of said neutral gas passage holes in said gas  
diffusing plate nearer to said upper electrode plate.

13. The plasma CVD apparatus according to claim 8,  
wherein said gas introduction pipes extend from a  
lateral direction of said plasma confining electrode  
to be coupled to side portions of said plasma  
5 confining electrode.

14. The plasma CVD apparatus according to claim 8,  
wherein said gas introduction pipes extend to pass  
through a peripheral portion of said plasma generation  
region to be coupled to upper portions of said plasma  
5 confining electrode.

15. A plasma CVD apparatus comprising:  
first and second electrodes;  
neutral gas introduction pipes;

a plasma confining electrode interposed  
5 between said first and second electrodes to separate a  
plasma generation region; and

a gas supply section interposed between said  
plasma confining electrode and said second electrode  
to supply said neutral gas,

10 wherein said gas supply section has a hollow  
structure defined by an upper plate and a lower plate,  
and has gas diffusing plates provided in the hollow  
structure, and has radial passage holes,

said gas supply section is connected to said  
15 neutral gas introduction pipes, and a plurality of  
neutral gas passage holes are provided for each of  
said lower plate and said gas diffusing plates to  
supply said neutral gas into said substrate processing  
region, and

20 a total opening area of said plurality of  
neutral gas passage holes in said gas diffusing plate  
on a side of said upper plate of said gas supply  
section is smaller than that of said plurality of  
neutral gas passage holes in said gas diffusing plate  
25 on a side of said lower plate of said gas supply  
section.

16. The plasma CVD apparatus according to claim  
15, wherein the number of said neutral gas passage  
holes in said gas diffusing plate on the side of said

lower said gas supply section plate is more than the  
5 number of said neutral gas passage holes in said gas  
diffusing plate on the side of said upper said gas  
supply section plate.

17. The plasma CVD apparatus according to claim  
15, wherein first ones of said plurality of neutral  
gas passage holes in each of said gas diffusing plates  
are different in diameter from second ones of said  
5 plurality of neutral gas passage holes in each of said  
gas diffusing plates.

18. The plasma CVD apparatus according to claim  
15, wherein positions of said neutral gas passage  
holes in said gas diffusing plate nearer to said lower  
said gas supply section plate are different from  
5 positions of said neutral gas passage holes in said  
gas diffusing plate nearer to said upper said gas  
supply section plate.

19. The plasma CVD apparatus according to claim  
18, wherein a region of said neutral gas passage holes  
in said gas diffusing plate nearer to said lower said  
gas supply section plate is arranged in an outside  
5 region of a region of said neutral gas passage holes  
in said gas diffusing plate nearer to said upper said  
gas supply section plate.

20.       The plasma CVD apparatus according to claim 15, wherein said gas introduction pipes extend from a lateral direction of said gas supply section to be coupled to side portions of said gas supply section.

21.       A plasma CVD apparatus comprising:

          first and second electrodes;

          neutral gas introduction pipes;

          a plasma confining electrode interposed

5   between said first and second electrodes to separate a plasma generation region; and

          a gas supply section interposed between said plasma confining electrode and said second electrode to supply said neutral gas,

10       wherein said gas supply section has a hollow structure defined by an upper plate and a lower plate, and has gas diffusing plates provided in the hollow structure, and has radical passage holes,

          said gas supply section is connected to said  
15   neutral gas introduction pipes, and a plurality of neutral gas passage holes are provided for each of said lower plate and said gas diffusing plates to supply said neutral gas into said substrate processing region, and

20       a distribution density of opening area consisting of said plurality of neutral gas passage holes is higher in a central portion of each of said



gas diffusing plates than in a peripheral portion thereof.

22. The plasma CVD apparatus according to claim 21, wherein the number of said neutral gas passage holes in said gas diffusing plate on the side of said lower gas supply section plate is more than the number  
5 of said neutral gas passage holes in said gas diffusing plate on the side of said upper gas supply section plate.

23. The plasma CVD apparatus according to claim 21, wherein first ones of said plurality of neutral gas passage holes in each of said gas diffusing plates are different in diameter from second ones of said  
5 plurality of neutral gas passage holes in each of said gas diffusing plates.

24. The plasma CVD apparatus according to claim 21, wherein positions of said neutral gas passage holes in said gas diffusing plate nearer to said lower gas supply section plate are different from positions  
5 of said neutral gas passage holes in said gas diffusing plate nearer to said upper gas supply section plate.

25. The plasma CVD apparatus according to claim

24, wherein a region of said neutral gas passage holes  
in said gas diffusing plate nearer to said lower gas  
supply section plate is arranged in an outside region  
5 of a region of said neutral gas passage holes in said  
gas diffusing plate nearer to said upper gas supply  
section plate.

26.       The plasma CVD apparatus according to claim  
25, wherein said gas introduction pipes extend from a  
lateral direction of said gas supply section to be  
coupled to side portions of said gas supply section.